ORIGINAL FILE

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	PP Docket No. 92-234
Inquiry into Encryption Technology	)	
For Satellite Cable Programming	)	

To the Commission:

COMMENTS OF TITAN SATELLITE SYSTEMS CORPORATION

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in the FCC Inquiry into
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Titan Satellite Systems Corporation hereby submits its comments pursuant to the Notice of Inquiry into Encryption Technology for Satellite Cable Programming (PP Docket 92-234, Adopted October 8, 1992; Released November 4, 1992).

In its Notice of Inquiry, the Commission seeks specific and general information from Titan Satellite Systems Corporation regarding the corporation's programs to (1) design, manufacture and distribute its Linkabit Smart Card System™, and (2) to develop a separate authorization center providing access control enabling programmers to authorize subscribers owning receivers with Linkabit Smart Card System modules.

In addition, the Commission seeks general comments regarding its assessment of the historical development of the Home Satellite Dish (HSD) market, current market conditions, the benefits of competition potentially brought by the addition of at least one additional source of video descrambling technology compatible with today's de facto standard, and current market conditions that might affect and influence the possible entry of a second source supplier of compatible descrambler modules.

SUMMARY

The Videocipher II ("VCII") technology is the de facto industry standard for the encryption and decryption of cable television programming for satellite transmission. Although General Instrument and the Titan Corporation co-own the core patents for the VCII system, a covenant not to compete prevented The Titan Corporation from entering this business before September, 1991. Accordingly, for approximately six years General Instrument did not have any actual or potential competition for the supply of descramblers.

General Instrument took advantage of its stranglehold on this market to more than double the price of its descrambler module during this period of time. Even more telling evidence of General Instrument's monopoly power is that it raised prices to this level despite falling prices of peripheral equipment, and serious and repeated breaches of the security of the VCII system, resulting in widespread dissatisfaction by programmers and other industry members with the VCII module.

Titan Satellite Systems Corporation is a joint venture formed in 1992 to commercialize the Titan Corporation's ownership of the core encryption patents and other intellectual property, and in doing so, breaking General Instrument's monopoly in the supply of descrambler modules for decrypting the scrambled satellite transmission of cable television programming. It is poised to begin manufacturing and selling the Linkabit Smart Card System™ (LSCS™), a message processing unit and decoder module which combines the original, uncompromised encryption algorithm of the VCII system with state of the art technology for controlling conditional access.

Faced with this threat to its monopoly, General Instrument has embarked on a scheme to prevent and hinder Titan Satellite Systems Corporation from entering the market. As will be explained in the detail that follows, this anticompetitive conduct has included the following:

(1) General Instrument has installed hardware and software devices in the television signal uplink and scrambling equipment of programmers to block Titan Satellite Systems Corporation from access to the horizontal blanking interval ("HBI") even though (a) until now, General Instrument used the HBI to transmit its own authorization data stream and continues to transmit the VCII commercial authorization messages here, (b) the Linkabit Smart Card System is accordingly also designed to use the HBI, and (c) the insertion of authorization messages into the HBI is not a system security threat.

(2) General Instrument has threatened programmers, without justification, that it will terminate their software maintenance and licensing agreements with General Instrument if they append Titan Satellite Systems Corporation's LSCS commercial unit keys to the existing VCII commercial key list residing in the HBI.

This attempt by General Instrument to crush the first hint of competition in the market to supply descramblers for decryption of satellite transmission of scrambled cable television programming is anticompetitive, unlawful and unfair. General Instrument's behavior injures not only Titan Satellite Systems Corporation, but every segment of the industry, including programmers, equipment manufacturers, distributors, and particularly consumers.

I. Introduction

Titan Satellite Systems Corporation is a joint venture corporation having three shareholders. The three shareholder members of the joint venture are: (1) The Titan Corporation, (2) Houston Satellite Systems, Inc., and, (3) Colorado Meadowlark Corporation, a company owned by Mr. Tom Ortolf, who is now a vice president of The Titan Corporation and president of Titan Satellite Systems Corporation.

As a part of the joint venture agreement, The Titan Corporation has agreed to design, manufacture and sell its Linkabit Smart Card System (LSCS) module on an exclusive basis to Titan Satellite Systems Corporation. Titan Satellite Systems Corporation will then market the LSCS modules to satellite receiver manufacturers, hardware distributors and dealers for integration into consumer satellite reception equipment, commonly called IRDs for "integrated receiver/descrambler."

The Titan Corporation acquired M/A-Com Government Systems Inc. on July 12, 1990. As part of its acquisition, The Titan Corporation acquired ownership of patents, trademarks, copyrights, and various unpatented proprietary rights that had been developed and maintained by M/A-Com Government Systems, Inc. These proprietary rights included, and continue to include many of the core encryption and decryption technologies currently employed in the Videocipher II™, Videocipher II Plus™, Videocipher Renewable Security (VCRS)™ scrambling technology, and potentially in the DigiCipher compression and digital high-definition television system now being developed by General Instrument Corporation. Some of these same core patents and associated licenses and property rights are co-owned by General Instrument Corporation, as a result of its acquisition of the Videocipher business of M/A-Com, Inc. and various of its subsidiaries and divisions in 1986. As part of its acquisition of M/A-Com Government Systems, Inc., The Titan Corporation, as the purchaser of M/A-Com Government Systems, Inc., was required to honor a five-year non-compete agreement between General Instrument Corporation and M/A-Com Government Systems, Inc. covering the use of the core Videocipher patents. The non-compete period expired in September 1991.

Expiration of the non-compete agreement provided The Titan Corporation the opportunity to explore opportunities to enter the HSD market and uniquely offer an encryption, decryption, and access control technology based on the original Videocipher patents and to do so in such a way so as to allow the programmers to utilize their existing scrambling systems in which they have a significant investment. Central to this opportunity was, and remains, the strategic objective of introducing competition into the descrambler marketplace without the need for government standards-setting or regulatory intervention, such actions which the Commission has twice been asked to consider and has twice rejected while maintaining as it does in this Notice of Inquiry that

competition is most desirable. *(at page 2, para 2 of this NOI.)* The Titan Corporation's strategic imperative is to allow a free, unfettered and newly competitive market to enjoy for the first time the opportunity to select a descrambler module supplier based on normal, competitive market rationales, not the least of which would be quality, security, price and service.

Titan Satellite Systems Corporation was formed as a joint venture in July to pursue those market objectives.

II. Comments on the Commission's Assessment of HSD Market Historical Development.

The Commission's overview of the historical development of the home satellite industry, as outlined in the NOI, is brief and accurate. It serves as a proper predicate to commentary on the specific issues the Commission seeks to review. In issuing the background material, however, the Commission does ask for supplementary information regarding Home Satellite Dish (HSD) market development. We seek to provide such supplementary information to clarify certain key historical issues that continue to affect the HSD market today and are likely to be important as the Commission conducts this inquiry. We stress that we are not seeking further discussion of a possible Commission-imposed encryption standard. However, we believe there is significant merit in expanding the record and discussion of key parts of the HSD market's historical development in those critical areas that are pertinent in this NOI, most particularly the potential benefits of competition in the manufacture and sale of compatible, Videocipher-based descrambler modules.

1. The extent of Videocipher piracy.

The Commission *(at paragraph 8, page 5)* correctly notes that pitacy has plagued the Videocipher II module manufactured by General Instrument almost from the start of scrambling. The extent of that piracy, until recently, has not been fully identified. The Commission estimates the level of piracy at perhaps "50 or 60 percent." However, based on data disseminated publicly by General Instrument in association with the recent "upgrade" program coupled with information provided in its prospectus prior to its recent public offering, it is clear that the level of piracy has been substantially higher.

As a result of this information, various trade publication reports and other information provided to the industry, it is now generally known that approximately 1.8 million Videocipher II descramblers were manufactured and sold between 1986 and January 1990.[1]

General Instrument estimated earlier this year that it would provide "free upgrades" to approximately 250,000 "legal" VCII consumers, leaving approximately 1.5 million Videocipher II descramblers that are unaccounted for. General Instrument has disingenuously estimated the status and/or location of these missing units to dilute the impact of the number of missing and clearly pirated units. This cannot hide the fact that earlier estimates which it has allowed the industry and this Commission to believe -- that is that 50 percent of the VCII population has been pirated -- are charitable; a better estimate is 80-85 percent.

A pertinent issue for the Commission to consider both in its historical overview and in the current proceeding is what might have happened to the HSD market if the market had enjoyed the power found in a competitive environment -- or the government had intervened -- to stop sale of the easily piratable modules when the system compromise was finally acknowledged by General Instrument. We note that when General Instrument and its supporters submitted Reply Comments on November 10, 1986[2], there was no mention of piracy, although news accounts of the "break" of the VCII were widespread at that time. In these 1986 filings, General Instrument and HBO noted that 60,000 VCII descramblers were authorized through the DBS Center by November 1, 1986. In public statements in late November 1986, General Instrument announced that the VCII had been broken. Certainly that information was available to them at the time of the November 10 filing.

We believe in this NOI that it is appropriate for the Commission to now consider whether the market generally, and programmers, specifically, who had just made a significant investment in this technology, had adequate recourse with General Instrument and whether consumers might have been better served if a market mechanism for recourse had been in place.

Would, perhaps, the number of VCII units vulnerable to piracy have been limited to as few as 100,000 VCII units, rather than today's approximately 1.5 million?

If the descrambler market had a competitive supplier, could, perhaps, the market have met the public's demand for new descramblers with a compatible system from a second manufacturer whose system implementation had not been breached?

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[1]In its prospectus, dated April 6, 1992, General Instrument estimated that 1.0 million of the pre-scrambling HSD system owners purchased descramblers (pg. 31), and that "more than 250,000 new satellite dishes" were installed in each of the years 1986-1988.

[2]Reply Comments of General Instrument Corporation and opposition to notice for evidentiary hearing in Notice of Inquiry FCC 86-336.

Would General Instrument have faced competitive market pressures that would have required it to respond more immediately to successfully develop a more secure implementation of the VCII module?

We believe the answer to these questions is yes -- a competitive market with inherent checks and balances based on risk and reward would have capped the piracy plague early, and we believe such a conclusion is particularly relevant to this NOI.

2. There has not been a true second-source manufacturer.

Historically, much has been made of the action by HBO to require General Instrument to license a second source manufacturer.

In comments to the Commission in 1986, HBO wrote:

> "HBO required M/A-COM (later General Instrument) to establish a 'second source' of manufacture of the Videocipher technology. M/A-COM has entered into an agreement with Channel Master pursuant to which Channel Master manufactures Videocipher II descrambling modules. This second source requirement eliminates a potential manufacturing bottleneck that would retard the flow of Videocipher II units to consumers."[3]

In its comments to the Commission in 1986, General Instrument wrote:

> "Contractually, we agreed to develop a second source for manufacturing the VCII M (module) ... In May of 1986, long before the required time period, we signed a Videocipher II Scrambling System-Descrambler Module Supply and License Agreement with the Channel Master Division of Avnet, Inc. Under the terms of this agreement, Channel Master will purchase custom chip sets and will manufacture descrambler modules in accordance with specifications which make the two units completely interchangeable ..."[4]

The Commission today must consider what General Instrument said the second source of manufacturing was or would be and its market effect, and test this against what has actually occurred. We note that General Instrument was unequivocal in its statements regarding the effect of the second source. Again in its Comments in 1986, General Instrument wrote:

> "By agreeing to license second sources, we effectively gave up any monopoly control that we might have had over this technology. Second sourcing was forced upon us by the programmers. We believe that the programmers would not have agreed on the Videocipher II standard if we had been able to retain monopoly control." (emphasis added)[5]

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[3]Comments of HBO in the Inquiry into the scrambling of satellite television signals, (FCC 86-336), page 22.
[4]Comments of General Instrument Corporation into the scrambling of satellite television signals, (FCC 86-336) page 24.
[5]Comments of General Instrument Corp, ibid, page 25.

It is readily apparent from this comment to the Commission, that General Instrument acquiesced to the establishment of a second source manufacturer to ensure the market, the FCC and the Congress that it would not -- or could not -- engage in monopolistic practices -- and, therefore, would not require regulation by this Commission or any other body.

In its Reply Comments in November 1986, General Instrument underscored its commitment to establishing a competitive second source manufacturer, noting most vigorously that it was *not* required under patent laws to license a second source manufacturer. General Instrument characterized its establishment of a second source manufacturer as "procompetitive."[6]

Notwithstatnding the above, it is now widely known in the HSD industry that Channel Master has not in years manufactured a descrambler. Instead, it has purchased completed modules directly from General Instrument, performed a quality check of the modules, and then loaded the system "seeds" into the descrambler, a simple software function, and shipped the modules directly to General Instrument IRD licensees and distribution customers.

Channel Master has been in fact merely a distributor of modules, beholden to General Instrument for its supply of those modules. The bounds of Channel Master's price have been in effect set by General Instrument because of the requirement by General Instrument that Channel Master purchase the vital cryptographic components of the system from General Instrument. The industry has neither enjoyed freedom from a manufacturing bottleneck, nor the potential benefits resulting from a second-source manufacturer's efficiencies or a market-driven effort to reduce cost of manufacturing and wholesale prices and improve overall product quality and performance. When one views the historical pricing of the Channel Master module versus the General Instrument module, it becomes readily apparent that Channel Master was more "aggressive" with those customers purchasing small quantities of modules, but was not competitive for larger customers (see Appendix A). However, some larger purchasers of modules did buy from Channel Master (even though Channel Master's higher volume price was greater than G.I.'s) as a matter of policy to not support G.I., because G.I. also competed against these module purchasers in the IRD manufacturing segment of the industry. In fact, we are told by several industry members that in recent months Channel Master actually refused to accept orders in excess of 3,000 modules per month.

Thus, there has been no second-source competition that would accrue to the benefit of the consumer and the industry supplying hardware and programming to those consumers. That the second source pledge is now a charade is apparent to the industry.

However, we believe it is still important today for the Commission to consider in this NOI the very rationales offered by HBO and General Instrument that so strongly supported the need for

[6]Reply comments of General Instrument Corporation, op cit, page 17.

a second source manufacturer to protect against monopolistic practices and disruptions in market development. If those rationales remain valid to any major extent today, and we believe they do, then the Commission should take this into account in assessing the potential benefits of true "intra-VCII competition."

3. Non-stop module price increases have hurt HSD consumers.

We endorse the Commission's position articulated in this NOI *(at paragraph 2, page 2)* stating, "We continue to believe that competition in the home satellite dish (HSD) marketplace is likely to benefit consumers by ... holding down the prices of these goods and services." The Commission writes *(at paragraph 10, page 5)* that the wholesale price of the VCII module "has increased significantly."

In fact, the low-volume wholesale purchase price of today's VCRS module of $336 is not only more than double the initial price of $150 for a VCII module, it is also more than the $325 wholesale price of the first stand-alone General Instrument 2000E consumer descrambler, with VCII module, introduced in 1986.

In its Reply Comments to the Commission in the 1986 inquiry, General Instrument responded to complaints about its pricing decisions saying:

> "We acknowledge that the suitability of any price is a matter of opinion."[7]

In a properly functioning market that is not the case. Price level is determined by competitive factors, not opinion. Because of the monopoly control of descrambler supply in the HSD industry, a single "opinion" has determined the price.

This pricing policy has hurt the consumers, and the impact merits comment to the Commission in establishing patterns and actions that will assist it in addressing the future benefits of intra-VCII competition.

It is our firm belief that in a competitive market for descramblers, the module price at the wholesale level would be determined by the manufacturer's level of investment, the costs of materials and production and the amount of associated risk. Over time, wholesale price would move closer to production cost. The risk of marketing a high-price module in the face of lower-priced competition selling compatible consumer products of comparable quality would, at the very least, be unwise. Competition, therefore, would work to the consumer's benefit. This is not the case in today's HSD market.

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[7]Reply Comments of General Instrument, op cit, page 8.

As the Commission so accurately states, "GIC controls directly or indirectly, the production of VCII decoder modules." *(at page 6, paragraph 12)* With that control also comes the ability to control price at the wholesale level, with major implications for pricing at other levels in the HSD distribution chain. The end result to date has been clearly detrimental to consumers.

A review of General Instrument's pricing practices since 1986 clearly supports this conclusion:

In 1985 and 1986, General Instrument sought to assure the United States Congress and this Commission regarding module pricing. Its executives in filings, prepared testimony and in response to specific inquiry stated that the company expected future price reductions in the module, saying that this was expected after the manufacture and wholesale purchase of 500,000 Videocipher II descramblers.[8] In its 1986 comments to the Commission, HBO also supported the contention that module price decreases were expected.[8]

General Instrument's module pricing record has not been faithful to its 1985-1986 statements.

In 1987, General Instrument increased the wholesale module price to $180.

In 1989, General Instrument increased the wholesale module price to $249.

In 1990, General Instrument increased the wholesale module price to $321.

In 1991, General Instrument increased the wholesale module price to $336.

This record simply can not be overlooked in light of the Commission's' expressed interest in assessing the potential consumer benefits arising from true intra-VCII competition

Clearly, General Instrument has felt no incentive to reduce price, based on this track record. Without competition, with no federal, state or local regulatory restraint, and with a monopoly on supply, General Instrument has had no market limit placed on its pricing practices. The result is unrestrained abusive exercise of its market power.

It is instructive to consider the number of modules-- *and therefore consumers* -- that might potentially have been positively affected had General Instrument met its earlier commitments to reduce price. As noted earlier (page 4), it is commonly held in the HSD industry that approximately 1.8 million Videocipher II modules were manufactured and sold into distribution by General Instrument. Thus, based on General Instrument's own forecast to this Commission in 1986, consumers and the HSD industry might well have expected wholesale price reductions that would have affected perhaps as many as 1.3 million Videocipher II descramblers and 1 million

[8]Comments of HBO, op cit, page 13: "Like almost all consumer electronics products, it is expected that the price of this product will decrease over time as the manufacturing processes beome more efficient." And Comments of General Instrument, op cit, page 16: "This forward pricing ... leaves little reason for this product to exhibit the significant price decreases commonly found with consumer electronics products until production goes beyond the 500,000 units which are currently forward priced. Beyond that level of production, there may be opportunities for cost reductions which would allow savings to be passed through to the consumer."

VCII Plus and VCRS descramblers sold to consumers. Not only did these consumers not enjoy lower prices for equipment, they have collectively paid millions of dollars more for receivers with General Instrument's VCII modules. Additionally, we also believe the continuous increase in the wholesale price of the module has indirectly cost millions of other consumers significantly. Those other consumers are cable television subscribers. Because an HSD system is, in many cases, the cable subscriber's only alternative for access to a wide variety of programming, increased module prices have contributed to maintaining and increasing the price barrier for these cable consumers to enter the HSD market, despite the efforts of other HSD market segments to reduce that price barrier. The result has been that the HSD market has not been as competitive as it might otherwise have been, even with price escalation by the local cable operators. Only recently, because of significantly lower financing costs, have HSD providers been able to offer a system at a competitive monthly rate to that offered by cable companies. This certainly would have occurred years earlier if a competitive situation had existed in the encryption segment of the HSD industry.

We believe competition in the manufacture and supply of compatible descrambler modules would have resulted in lower consumer prices, not only for existing HSD consumers, but for potential HSD consumers as well.

4. **Non-stop module price escalation has hurt retailers.**

The impact of the non-stop escalation of module price has had a very direct and negative impact on retail price, and therefore on the ability of satellite retailers to offer lower-priced equipment and to attract new consumers.

As the Commission is aware, the HSD market has traditionally employed a multi-step distribution mechanism. Traditionally, the process has involved sales of modules by General Instrument to a licensed receiver manufacturer, followed by manufacturer integration of the module into a receiver and then sales to distributors, then distributor sales to retailers, and ultimately retailer sales to consumers.

At each step in this distribution process, the initial wholesale price is marked up, reflecting value-added and the associated costs of business at each step in the process. Typically and conservatively, HSD manufacturers require at least a 10 percent gross profit on the cost of a subcontracted wholesale component, distributors 20 percent on a finished good, and retailers typically 35 percent gross profit. These various margins reflect the cost of doing business, compensate for typical risk, allow for a competitive level of customer service, and provide a profit return necessary to continue to provide incentive for investments in each of these various steps in the chain of distribution.

It is instructive to consider what the benefit associated with each price increase was and the impact on pricing through distribution to the consumer.

"Benefit"[1]	GI Price to OEM	OEM to Distr.	Distr. price to Dealer	Retail Price	$ Increase in Retail Price
Scrambling	$150	166.66	208.33	320.51	
Security	$180	200.00	250.00	384.61	$ 64.10
II Plus	$249	276.66	345.83	532.05	$147.44
Warranty	$321	356.66	445.83	685.89	$153.84
Modem	$336	373.33	466.66	717.95	$ 32.06
Total Cost Increase Over 6 years	$186	206.67	$258.33	397.44	

[1] "Benefit" describes the reason given by General Instrument for the price increase.

The above depicts what typically would have happened to the retail and wholesale prices of a product in a market where component price increases were being forced on manufacturers resulting in retail price increases. However, as a result of lower pricing for programming due to competition, and because of innovations in the other HSD market segments, primarily in the hardware segment costs (dishes, LNBs, feeds, IRDs and cable), and in an effort to keep their HSD industry products competitive (like other consumer electronics products, the price of a HSD system should have been declining), the actual price to the consumer of a complete HSD system remained fairly constant. One can only speculate as to how strong the HSD industry would have been with competition in the encryption segment. Unfortunately, because of the monopoly in that segment, the benefits that should have accrued to the consumer were offset by high descrambler pricing, hence, accrued to the benefit of only General Instrument.

During this same six year period, the consumer price index increased an average of 3.8 percent (Appendix B) annually. Similarly the consumer price of most consumer electronics products of comparable initial purchase price in 1986 as that of a stand-alone satellite descrambler or receiver have fallen.

According to the Electronic Industries Association (E.I.A.), nominal wholesale prices of Videocassette Recorders have declined 71.5% since their introduction to the market in 1978, and now average $231.00. Prices have continued to decline even in the face of a relatively flat market. Wholesale prices of Camcorders, introduced to the market in volume in the middle 1980's, have declined 28.5% since 1988 (Appendix C). It should be noted that the videocassette recorder and camcorder are both much more complicated products to engineer and manufacture.

The impact of the non-stop escalation of module price under General Instrument's practice is even more troublesome when the module is considered as a factor in the cost of manufacturing an IRD.

In 1987, when IRDs first entered the HSD market, the cost of the VCII module was $180 and the manufacturing cost of a low-end receiver element was approximately $245. The typical manufacturer cost before distribution, then, was approximately $425, thus the VCII module represented approximately 42 percent of that total manufacturer cost.

In contrast today, manufacturers estimate that the cost of a low-end receiver element of an IRD is approximately $160 while the VCRS module is $336, making the manufacturing cost of a low-end IRD with the descrambler approximately $496. The descrambler now comprises approximately 68% of this integrated cost.

It is noteworthy that manufacturers who compete vigorously in the HSD retail market have on average reduced the production cost of the receiver element of an IRD from $245 to $160, or 35 percent, while in the same time period General Instrument has increased the module from $150 to $336, or 124 percent.

The chart on page 10 outlines the price impact of a monopoly imposing its decisions without restraint. We believe that the Commission must take note of what competitive manufacturers have done in not only containing, but reducing, their costs to maintain both their financial strength and to expand the HSD market and their market share. If competition amongst manufacturers has resulted in cost reductions, the same must be considered as a likely outcome of intra-VCII module competition. It should also be noted in the page 10 chart that at least two of the increases were justified by General Instrument by: (1) adding a three-year security replacement warranty to justify a module price increase of $72 per unit, and (2) adding a modem to provide impulse pay-per-view capability to justify a $15 per unit price increase. However, because of their monopoly position, General Instrument forced these "add-on" features with every module. Descrambler modules today are <u>not</u> offered without the warranty or modem. Certainly this would not be the case in a competitive marketplace.

Clearly, this existing monopoly situation is not in the interest of the consumer whom the Commission is charged to protect. And it is equally clear that the market place is not working.

5. <u>Non-stop module price escalation reduced research and development by manufacturers.</u>

Approximately 15 companies have secured licenses from General Instrument to integrate the module into their satellite receivers, with 12 original equipment manufacturers (OEMs) active in the consumer market over the past six years. These companies compete daily for the loyalty of

distributors and dealers and compete to attract new buyers. This competition is, as would be expected, based on price, features, quality, marketing ability and service.

Either to reduce cost and thereby price, or, to add new features to attract new buyers, satellite manufacturers have traditionally invested significantly in research and development programs. The non-stop escalation of the module wholesale cost has been particularly detrimental to manufacturers' efforts to reduce cost and the retail price. Investments in staff and successful development programs to reduce a wholesale price by $20-$50 per unit have consistently been negated by the significant module price increases from General Instrument. This has resulted in only the largest of manufacturers having the ability to afford to continue these programs that ultimately benefit the HSD consumer.

In the meantime, wholesale prices of the module have increased 124% since its introduction to the market in 1986.

6. The price of the VCRS smart card security replacement element is high.

The Commission *<at paragraph 9, page 5>* notes the introduction of the VCRS iteration of descrambler module with its future capacity to accept a smart cart for security upgrade. The Commission states, "Such an upgrade presumably would be simpler and less expensive than the switchout of complete modules now taking place."

We note that while General Instrument has not issued a public notice in the form of a price list or press release, the company has stated in trade show seminars and been reported in trade publications as saying the price of a VCRS smart card (it has been known variously as CipherCard and TV PassCard) will be approximately $99 to the consumer. This is a high replacement price for the consumer; so high in fact that it can be argued that this is not truly "replaceable security."

Based on the Commission's review of General Instrument's fidelity to initial price announcements, the Commission may wish to consider the impact of smart card pricing on the future of the HSD market, and the impact a true second-source manufacturer might have on the price of future security upgrades.

7. The upgrade has stranded 300,000 to 400,000 VCII consumers.

The Commission notes that General Instrument is soon to complete a "free upgrade" for owners of untampered Videocipher II descramblers who also subscribe to services offered by programmers that have entered into an upgrade agreement with General Instrument.

Perhaps overlooked in the preparation of this NOI is the fact that General Instrument has instituted a policy/program whereby it will offer a "free" smart card or replacement module with a

smart card to consumers during the first three years of ownership of a VCII Plus or VCRS-equipped system, providing the module was manufactured on or after April 1, 1991. (This is actually not "free", as consumers have paid $72 per module to have this security warranty. See chart on page 10). After the three-year period, the qualified consumer would pay the $99 fee for a smart card security upgrade, or presumably, the price of a new module with a smart card.

It should not be overlooked, however, that consumers who purchased VCII Plus-equipped units, which do not contain the ability to receive a smart card and were manufactured prior to April 1, 1991, are not covered by General Instrument's policy. General Instrument has stated publicly that it is not responsible for providing a free upgrade to these legitimate, subscribing consumers. It should also be noted that General Instrument has produced and sold an estimated 700,000 VCII Plus units that do not have a receptacle to accept a smart card, of which an estimated 300,000 are not covered by the three-year security warranty. Additionally, purchasers of these modules were denied the opportunity to purchase the warranty protection when they requested to do so. Beginning in the second quarter of 1994, this 300,000 figure will increase by 20,000 to 25,000 per month (the approximate number of monthly module sales in 1991) due to the expiration of unit warranties. In the event of another Videocipher system security compromise, the industry asks who will be responsible for taking care of these consumers? Or will they be required to purchase a new descrambler module with a smart card from a sole source supplier?

That such a situation is not in the consumer's best interest is obvious, as well as it is obvious that General Instrument faces no market restraint in instituting such a policy. The Commission may wish to consider what impact competition might have had on this apparently arbitrary policy of non-support by General Instrument, as well as the situation of potentially having an estimated 700,000 legitimate, subscribing consumers who may again be required to purchase a descrambler module to be able to continue to receive programming for their HSD system.

8. Compromise of the VCII technology has been in the implementation of the hardware supporting the conditional access features.

The Commission correctly notes *<at paragraph 13, page 6>* that the core Videocipher technology, of which The Titan Corporation is co-owner, has remained secure, including the encryption algorithm. This has been repeatedly asserted by General Instrument in its presentations to the HSD industry and affirmed in trade publication accounts of piracy attacks.

This point is salient to this NOI, as the Commission elects to consider the impetus to rumored changes by General Instrument in the encryption algorithm and other portions of the encryption system. These changes include the installation of hardware and software devices in the programmers' scrambling systems located at their uplink facilities. The purpose of the installation

of these devices is to eliminate the capability to insert and transmit authorization messages in the horizontal blanking interval of the programmer's signal. The Commission should consider whether, as we believe, such actions are intended to erect a barrier to a legitimate, competitor in intra-VCII module supply under the guise of security enhancement(s).

9. **The industry asked the Commission to reject standards in 1989 to provide itself the opportunity to find a second source VCII manufacturer, or to implement improvements to VCII or to implement an altogether different encryption technology.**

The Commission prudently, in two prior inquiries, rejected calls from some elements of the HSD marketplace to impose an encryption standard, with some calling for that standard to specifically be the VCII.

It is noteworthy for this inquiry that while General Instrument's position was supported during the inquiry process by many elements of the HSD business community, the support was not an endorsement of General Instrument and its efforts to improve signal security with the VCII technology. Rather, the business segment of this market was opposed to a VCII standard in that it would lock the industry into a technological implementation by General Instrument, leaving them no opportunity to look for a second source supplier or to implement an altogether different and incompatible encryption technology. It is clear from the record of the 1989 "Inquiry into the Need for a Universal Encryption Standard" that the industry, as late as 1989, wished to retain the opportunity to engage a true second source.

III. Commission questions on specific details of the Titan Satellite Systems Corporation program

The Commission *<at paragraph 14, page 7>* seeks "comment from Titan on its plans and prospects for competing with GIC in the supply of VCII modules. In particular, when does Titan expect to begin selling modules and at what price? How is the price expected to change over time? While Titan's conditional access system will obviously be proprietary, what can Titan tell us about its security? If Titan plans to use a smart card, how much would a security upgrade cost? If such an (commercial) upgrade were to happen, what effect, if any would it have on the ability of Titan to compete with GIC in supplying decoder modules?"

a. Market Introduction Plans

As noted in our introduction to these Comments, Titan Satellite Systems Corporation is in the advanced stages of its development of the Linkabit Smart Card System (LSCS). The LSCS development is an enhanced conditional access system that employs and improves upon the basic encryption technology of the Videocipher II system. Our system design provides interface compatibility with any consumer or commercial version IRD or stand-alone descrambler currently using a VCII, VCII Plus or VCRS descrambler module, providing convenience to consumers and the business segments of the HSD industry.

Key elements of the overall LSCS system are:

(1) A conditional access system with the flexibility to meet future piracy threats through implementation of an advanced, high-security smart card;

(2) Commercial and consumer descrambler modules manufactured with replaceable smart cards "married" to a highly secure, very large scale application-specific integrated circuit (ASIC);

(3) Uplink equipment and message processing software for installation at each programmer uplink facility; and,

(4) A Titan Authorization Center.

While our authorization channel is distinct and different from that of General Instrument's system, it shares elements in common at the appropriate level such that it provides a seamless interface with the current encryption technology. It is transparent to consumers subscribing to satellite cable program services, and is invisible to and separate from General Instrument's authorization channel information while co-existing in the programmer's satellite signal(s).

Implementation of our system by programmers is simple and straightforward, requiring only the installation of one message processing device to process and interleave the LSCS message stream with the existing messages already being transmitted in the horizontal blanking interval of the programmer's satellite signal, and the installation of a V-Sat satellite receiver to receive the Titan Authorization Center transmission of authorization channel information.

Our development program has already passed many key milestones including: completion of equipment design, the start of fabrication of the secure digital ASIC which will handle descrambler signal processing, installation of the computer equipment that will operate the Titan Authorization Center, installation at our San Diego facility of the transmit and receive equipment for communications between the Titan Authorization Center and programmers' uplink locations as well as for system performance monitoring, completion of the initial stage of an

exhaustive system security review by outside consultants, prototype manufacturing of LSCS descramblers and alpha testing. In November 1992, we successfully conducted two days of live system demonstrations for satellite/cable programmers attending briefing sessions at our facilities in San Diego, CA.

Our plans now call for pilot production of consumer descramblers in early February 1993, and extensive live demonstrations of the LSCS system during the January 14-16, 1993, trade show conducted by the Satellite Broadcasting and Communications Association in San Diego. All of this is preparatory to the start of our manufacturing ramp-up beginning in early March 1993.

b. **Plans and prospects for competing with General Instrument.**

It is the intent of Titan Satellite Systems Corporation to compete with General Instrument on the basis of price, quality, reliability, availability, security, service and a level of intra-VCII compatibility that will provide the entire market with choice.

This of course will only occur if there exists a level playing field, where a free, competitive market can make determinations on those key issues. We will speak more on the NOI issue of our ability to compete effectively later in this document.

c. **Timing of sales of LSCS modules to equipment manufacturers.**

The Commission asks when we will begin selling. We are in fact doing so today. We have presented and reviewed contracts and purchase agreements with all active manufacturers and most distributors serving the HSD market.

Today we have orders for at least 100,000 LSCS modules, with initial deliveries in April 1993. These orders are contingent upon Titan Satellite Systems Corporation securing contracts with a significant number of satellite/cable programmers resulting in the on-going authorization of LSCS modules to receive a wide range of subscription services. This has yet to happen. Despite this contingency, and it is a major one, the level of manufacturer and distributor response is significant. For the past three years, the sale of new HSD systems has been flat, with industry estimates ranging from 250,000 to 300,000 annually. With the effort to convert more than 1 million consumers who have owned tampered VCII modules, it is likely that module sales for conversions and new system sales could approach 1 million units in 1993 alone. In a normal year, Titan Satellite System Corporation's orders would represent approximately one-third of an entire year's descrambler sales. In this upcoming, abnormal year, these orders represent approximately 10 percent of estimated demand.

d. **Timing of sales of uplink equipment and software to programmers.**

We have also been meeting with programmers to review technical issues and a proposed contract that would lead to their use of the LSCS system to serve the HSD market. These agreements would include installation of uplink equipment at no cost to the programmer. As noted above, we have yet to conclude any contractual agreement with a programmer, although we have received four Letters of Intent from programmers who service this market, with several more expected within the next several weeks.

e. **Price of consumer LSCS modules**

Titan Satellite Systems Corporation announced in August 1992 that the price for the LSCS consumer module will be $249. The module purchase agreement we are presenting now to manufacturers and distributors calls for the $249 price. This price point is $87 lower than the current low-volume wholesale price for the consumer VCRS module.

In addition, we have offered manufacturers a one-time, introductory price of $199 per unit for the first 100,000 LSCS consumer modules manufactured. This one-time offer is $137 less than General Instrument's list price. Our commitment for this price level represents a unit volume equal to approximately one-third of the annual modules produced and sold in each of the last three years in the HSD market.

For manufacturers, distributors and dealers, this introductory price of $199 for the first 100,000 units represents a potential $13,700,000 savings from the amount that would be spent for 100,000 VCRS modules at today's wholesale price, and significantly greater savings for HSD consumers. We believe these savings will be used to improve individual business opportunities and to reduce retail prices.

f. **Price and availability of LSCS commercial module.**

Titan Satellite Systems Corporation will produce a commercial LSCS module with deliveries planned to begin in the second quarter of 1993. The commercial module, as with the consumer module, will come standard with a smart card and can be easily and inexpensively upgraded should that become necessary.

Our announced wholesale price for the commercial module is $344. This compares to General Instrument's list price for a commercial descrambler of approximately $450.

Again, our pricing has the potential of providing major financial savings for operators of cable systems -- perhaps as much as $25 million, based on a commercial descrambler universe of approximately 250,000 to 300,000 units today.

g. **Price changes over time.**

Titan Satellite System Corporation's plans are to invest extensively in removing additional cost from the descrambler module and passing much of that savings on through our wholesale pricing.

We have already announced our first step toward achieving this goal. This will result, in the second half of 1993, in the manufacture and sale of a consumer descrambler board without the plastic cage that currently encases the descrambler's printed circuit board.

Our potential customers are excited about this development for two reasons.

Firstly, Titan Satellite Systems Corporation will offer this descrambler unit at the wholesale price of $209, or nearly 16 percent less than our initial price of $249 for participating manufacturers. It also will represent a price $127 lower per unit (37 percent) than General Instrument's wholesale price. This also translates into a major economic benefit for the industry, a benefit that we are confident will be passed along in terms of lower retail prices, or much more attractive packages of hardware combined with programming for the same price.

Secondly, the manufacturers are pleased because this "cageless" descrambler board will allow their engineering staffs to design slimmer, more attractive IRDs that will occupy less space in a consumer's home. The current module design from General Instrument with a plastic casing that holds the board is nearly two inches thick. Elimination of the plastic housing and the reduction of space required for the descrambler within an IRD is something HSD manufacturers have sought for some time. We endorse their belief that more attractive IRD designs, coupled with lower prices, will boost new consumer sales. Our discussions in this area are indicative of what transpires in a competitive environment, i.e., a vendor responding to a customer's needs.

We have also announced our broad development plans to proceed in further reducing the cost of the security elements incorporated in a consumer receiver. To this end, we plan to develop custom packages of security elements, essentially the LSCS smart card and our proprietary security chip. We also plan to expand that offering with an optional modem for impulse pay-per-view capability. Essentially, this will allow our manufacturer customers to design the smart card access and security chip into the IRD as an integral element of the receiver and to remove component redundancy, rather than continue today's practice whereby the security technology is an adjunct, peripheral element of a receiver, the presence of which is masked by the large receiver housing. It is premature for us to estimate wholesale prices for the LSCS components program. However, we

are certain that it can only lead to a vast reduction in the wholesale and consumer price of an HSD receiver.

h. Overview of the LSCS smart card and conditional access system.

The LSCS system has been developed after careful review of historical developments that allowed the VCII module to be easily pirated even though the encryption algorithm used by the system was not defeated. The principal VCII attacks, as General Instrument has broadly discussed with the HSD industry, have been directed at the integrated circuit, known as the cryptographic microcomputer, that processed the secure information. The cryptographic microcomputer was susceptible to several different pirate attacks, each resulting in the ability to view all scrambled channels at little or no cost.

The LSCS system counters these attacks by performing all of the cryptographic processing inside a highly secure, state-of-the-art smart card, with other security functions inside a single application-specific integrated circuit (ASIC). The LSCS smart card will be married to an individual module during manufacture and will appear as a standard feature of the LSCS system. This "marriage" is significant in that both the ASIC and smart card must be broken to compromise the system. Even if a break should occur, the break is specific to a single consumer or commercial descrambler. Furtherance of any such break would require accomplishing the same type of break unit by unit.

The security approach we are taking is similar to General Instrument's VCRS implementation which also uses an ASIC that has the future capability of communicating with a smart card. However, the approaches are distinct in that GI presently embeds its cryptographic processes into the descrambler's secure microcomputer ASIC. This embedded microcomputer/signal processor contains the cryptographic personality of the VCRS descrambler. In our system, an exchange of the smart card will completely remove the cryptographic personality of the unit and provide an entirely new one, leaving none of the cryptography behind to be used in the future by a pirate. This approach allows the LSCS complete flexibility in dealing with piracy, i.e., the cryptography of the system can be completely changed with an exchange of the smart card.

The LSCS system is unique in that, because of the Titan Corporation's co-ownership of core Videocipher patents and intellectual property, the LSCS system is capable of co-existing with the VCRS system in a programmer's satellite signal, and can do so while utilizing the programmer's existing scrambling system. A minor amount of new hardware must also be installed for each channel that is scrambled, which Titan Satellite Systems Corporation has agreed to install at Titan Satellite System Corporation's expense. This approach makes the addition of an

intra-VCII encryption competitor economically practical for programmers. Alternatively, a non-compatible encryption system would require the purchase of new scrambling hardware and software, as well as requiring programmers to uplink their signal to a different satellite transponder at considerable incremental expense.

For the LSCS system to function, programmers must "append" at least one LSCS commercial unit key (identification) to their existing commercial unit key list. This LSCS unit key is the identification of the descrambler located within the message processor unit installed by Titan Satellite System Corporation at each programmer's uplink. Adding this LSCS key and authorizing it allows the LSCS system to access each programmer's program key, and ultimately allows for authorization and deauthorization of LSCS descramblers for each programmer's service. The append function is a normal operation of the existing system, and is used to add VCII Plus or VCRS commercial descramblers to the existing population.. When Titan Satellite System Corporation sells commercial descrambler units, (typically for use by cable companies) additional LSCS unit I.D.'s (keys) must be added to the commercial unit key list.

A communication link must also be established between the Titan Authorization Center and the various business systems authorized to sell programmers' services. Titan Satellite System Corporation has contracted with U.S. Sprint to provide this service at Titan Satellite System Corporation's expense for the first year. From the business systems standpoint, the communication link is "invisible". If a LSCS module is being authorized, that information is transmitted to the Titan Center. Likewise, if a G.I. module is being authorized, the information to execute the authorization goes to G.I.'s DBS Authorization Center. The business system does not need to change its operation at all.

i. **Consumer cost of replacing the LSCS smart card.**

The cost to the consumer for a replacement LSCS smart card due to a breach of the system will be approximately $20.

j. **The need for an upgrade of VCII commercial units.**

Titan Satellite Systems Corporation intends to work with programmers and cable system operators in the development of plans to upgrade commercial VCII units to new levels of system security. As previously mentioned, we are prepared to begin delivery of LSCS commercial units in the second quarter of 1993.

Our intent in supporting such an upgrade would be to facilitate improved security, and we would expect to compete with General Instrument for this business as well. Installation and use of

our commercial units will be seamless and transparent to cable systems and their customers, and will not require access to General Instrument proprietary information.

As previously mentioned, we are concerned by reports from potential customers that the ultimate intent of General Instrument in such an upgrade is to eliminate the ability to transmit LSCS authorization messages in the horizontal blanking interval (HBI).

General Instrument announced nearly two years ago that the VCII Plus and VCRS encrypted messages would be transmitted in the vertical blanking interval (VBI) and also stated then that there would be no change in the processing of commercial authorizations. It is apparent to us that General Instrument's new plans are using "improved security" as the basis to block Titan Satellite Systems Corporation's market entry. Titan Satellite Systems Corporation favors and supports an upgrade of all VCII commercial units to VCRS or LSCS commercial descramblers. The elimination of the VCII commercial cryptographic personalities from the programmers' data base and authorization message stream will accomplish just this. Elimination of the ability to insert any new, secure messages into the HBI of a programmer's signal transmission would only be done, we believe, to block Titan Satellite System Corporation's market entry.

k. The issue of imperfect compatibility in a competitive intra-VCII market.

The Commission *<at paragraph 15, page 8 of NOI>* seeks comment on the potential market impact of two sources of VCII modules that are not perfectly compatible. We are uncertain as to exactly what the Commission means by "imperfect compatibility." We respond assuming the Commission's concern regards the impact should the encryption systems not be precisely identical technically, or, the possibility that the descrambler modules are not identical in consumer features or do not offer access to the same menu of programming.

Regarding encryption and conditional access, the LSCS and Videocipher technologies are distinct yet share enough elements in common so that the "imperfect" match is inconsequential to system users. Our systems support the identical module-receiver interface now in existence in the market and require no modification by manufacturers to support our LSCS module. In terms of conditional access and encryption, both the LSCS and GI systems employ a hierarchical key distribution mechanism. Because the authorization data are similar in form, though different cryptographically, the current DBS Center could process information for both systems simultaneously with virtually no change to the existing center design. Changes required would be primarily procedural in nature to ensure system separation and security.